```
 e Johansson, Eric B./in
E1            1     JOHANSSON, ELISABET/IN
E2            1     JOHANSSON, ELOF/IN
E3           20 --> JOHANSSON, ERIC B/IN
E4            1     JOHANSSON, ERIC G B/IN
E5            1     JOHANSSON, ERIC H JR/IN
E6            1     JOHANSSON, ERIC T/IN
E7            1     JOHANSSON, ERIK/IN
E8            1     JOHANSSON, ERIK GUNNAR/IN
E9            1     JOHANSSON, ERIK I/IN
E10           1     JOHANSSON, ERIK K G/IN
E11           4     JOHANSSON, ERIK KARL GUSTAV/IN
E12           1     JOHANSSON, ERIK LENNART/IN

=> s e3
L1           20 "JOHANSSON, ERIC B"/IN

=> d l1 1-20
```

1. 5,130,083, Jul. 14, 1992, Hydride resistant spacer formed from interlocking strips; **Eric B. Johansson**, 376/441, 438, 442, 462 [IMAGE AVAILABLE]

2. 5,089,221, Feb. 18, 1992, Composite spacer with Inconel grid and Zircaloy band; **Eric B. Johansson**, et al., 376/442, 438, 441, 448, 453 [IMAGE AVAILABLE]

3. RE 33,818, Feb. 11, 1992, Axially shaped channel and integral flow trippers; Russell L. Crowther, Jr. deceased, et al., 376/443, 439, 444, 448 [IMAGE AVAILABLE]

4. 5,085,827, Feb. 4, 1992, Nuclear fuel assembly spacer and loop spring with enhanced flexibility; **Eric B. Johansson**, et al., 376/444, 434, 438, 441, 448 [IMAGE AVAILABLE]

5. 5,078,961, Jan. 7, 1992, Self locating springs for ferrule spacer; **Eric B. Johansson**, et al., 376/448, 434, 439, 441, 443 [IMAGE AVAILABLE]

6. 5,069,864, Dec. 3, 1991, Nuclear fuel assembly spacer and spring; **Eric B. Johansson**, 376/441, 438, 442 [IMAGE AVAILABLE]

7. 5,032,351, Jul. 16, 1991, Modified cross point spacer apparatus and construction; **Eric B. Johansson**, 376/438, 434, 442, 448; 976/DIG.81 [IMAGE AVAILABLE]

8. 5,002,726, Mar. 26, 1991, Nuclear fuel assembly spacer and loop spring with enhanced flexibility; **Eric B. Johansson**, 376/448, 444 [IMAGE AVAILABLE]

9. 4,999,153, Mar. 12, 1991, Flow tripper in combination with spacer deflector; **Eric B. Johansson**, et al., 376/443, 439, 444, 448 [IMAGE AVAILABLE]

10. 4,997,621, Mar. 5, 1991, Lower tie plate with stepped holes to

control pressure drop and flow distribution; **Eric B. Johansson**, et al., 376/444, 443, 445 [IMAGE AVAILABLE]

11. 4,963,318, Oct. 16, 1990, Spring lock washer for tie rod nuts; **Eric B. Johansson**, et al., 376/446, 434 [IMAGE AVAILABLE]

12. 4,913,875, Apr. 3, 1990, Swirl vanes integral with spacer grid;

Eric B. Johansson, et al., 376/439, 443; 976/DIG.60, DIG.75 [IMAGE AVAILABLE]

13. 4,889,684, Dec. 26, 1989, Hydraulic reinforcement of channel at lower tie-plate in BWR fuel bundle; **Eric B. Johansson**, 376/444, 203, 439, 443; 976/DIG.61 [IMAGE AVAILABLE]

14. 4,876,063, Oct. 24, 1989, Double-d water rod for 9 by 9 fuel bundle; **Eric B. Johansson**, 376/444, 439, 443; 976/DIG.60, DIG.64 [IMAGE AVAILABLE]

15. 4,871,509, Oct. 3, 1989, Fuel column retainer using radially compressed spring; **Eric B. Johansson**, 376/412, 418, 420, 451; 976/DIG.52 [IMAGE AVAILABLE]

16. 4,749,544, Jun. 7, 1988, Thin walled channel; Russell L. Crowther, et al., 376/443, 434, 439, 444, 448; 976/DIG.61 [IMAGE AVAILABLE]

17. 4,749,543, Jun. 7, 1988, Axially shaped channel and integral flow trippers; Russell L. Crowther, et al., 376/443, 439, 444, 448; 976/DIG.60, DIG.61 [IMAGE AVAILABLE]

18. 4,675,154, Jun. 23, 1987, Nuclear fuel assembly with large coolant conducting tube; Harold L. Nelson, et al., 376/444, 439, 443; 976/DIG.60 [IMAGE AVAILABLE]

19. 4,571,324, Feb. 18, 1986, Nuclear fuel assembly spacer; **Eric B. Johansson**, et al., 376/441, 438, 442; 976/DIG.73 [IMAGE AVAILABLE]

20. 4,129,477, Dec. 12, 1978, Axially alignable nuclear fuel pellets; **Eric B. Johansson**, et al., 376/429; 976/DIG.50 [IMAGE AVAILABLE]


```
=> s l1 and (part?(p)rod# or short?(p)rod#)
       1426717 PART?
        282830 ROD#
        103674 PART?(P)ROD#
        578823 SHORT?
        282830 ROD#
         27580 SHORT?(P)ROD#
L2          18 L1 AND (PART?(P)ROD# OR SHORT?(P)ROD#)

=> d 4,292,128 acc
TEXT DATA FOR PATENT 4 IS NOT AVAILABLE, SEE THE MICROFILE OR PAPER
INSTEAD
TEXT DATA FOR PATENT 292 IS NOT AVAILABLE, SEE THE MICROFILE OR PAPER
INSTEAD
TEXT DATA FOR PATENT 128 IS NOT AVAILABLE, SEE THE MICROFILE OR PAPER
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INSTEAD

=> d 4292128 acc

1. 4,292,128, Sep. 29, 1981, Boiling water type nuclear reactor; Renzo Takeda, et al., 376/370, 210, 267; 976/DIG.115 [IMAGE AVAILABLE]

=> s l2 and (spacer# or spacer(p)grid#)
         84588 SPACER#
         67135 SPACER
20 NOV 92 15:24:10   U.S. Patent & Trademark Office   P0005
         41491 GRID#
          1023 SPACER(P)GRID#
L3   15 L2 AND (SPACER# OR SPACER(P)GRID#)

=> s l3 and (spacer(p)lower and spacer#(p)upper)
         67135 SPACER
        928963 LOWER
         16694 SPACER(P)LOWER
         84588 SPACER#
        660598 UPPER
         21419 SPACER#(P)UPPER
L4   11 L3 AND (SPACER(P)LOWER AND SPACER#(P)UPPER)

=> s l4 and (spacer(a)pitch)
         67135 SPACER
         63076 PITCH
             6 SPACER(A)PITCH
L5   1 L4 AND (SPACER(A)PITCH)

=> s l5 and (reduc? or minimiz? or decreas?)
        930178 REDUC?
        277443 MINIMIZ?
        401275 DECREAS?
L6   1 L5 AND (REDUC? OR MINIMIZ? OR DECREAS?)

=> d l5
20 NOV 92 15:35:12   U.S. Patent & Trademark Office   P0006
'~RD' IS NOT A RECOGNIZED COMMAND

=> d l6

1. 5,032,351, Jul. 16, 1991, Modified cross point **spacer** apparatus and construction; **Eric B. Johansson**, 376/438, 434, 442, 448; 976/DIG.81 [IMAGE AVAILABLE]

=> d l6 kwic

US PAT NO: 5,032,351 [IMAGE AVAILABLE]   L6: 1 of 1
TITLE: Modified cross point **spacer** apparatus and construction
INVENTOR: **Eric B. Johansson**, San Jose, CA

ABSTRACT:
An improved **spacer** and method of making a **spacer** is disclosed for use in a nuclear fuel bundle wherein a plurality of fuel rods enclosed within a channel are maintained in parallel side-by-side relation by a

plurality of the **spacers**. Each **spacer** is placed within a fuel bundle at selected elevations between **upper** and **lower** tie plates. The improved **spacer** is a member of the class of **spacers** wherein solid strips of material are welded at interstitially placed tube members between the fuel rods to form the continuous **spacer** **grid**. The improvement constitutes forming separate **upper** and **lower** **reduced** section **grids** from separate, normally aligned, first and second parallel sets of **grid** members. One **grid** is formed for the top of the **spacer**; the remaining **grid** is formed for the bottom of the **spacer**. Tube members placed interstitially between the fuel rods are used to interconnect the **grids**. The tube members themselves are in turn notched; the notches are at the **upper** portion of the tube members to receive the **upper** **grid** and at the **lower** portion of

US PAT NO: 5,032,351 [IMAGE AVAILABLE] L6: 1 of 1

the tube members to receive the **lower** **grid**. **Grids** are placed within the notched tube members and fastened, typically by welding to the top and bottom of t

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=> s 376/439,443,444,371,373/ccls and (short?(p)length(p)rod#)
           106 376/439/CCLS
           105 376/443/CCLS
           106 376/444/CCLS
            88 376/371/CCLS
            23 376/373/CCLS
           339 376/439,443,444,371,373/CCLS
                 ((376/439 OR 376/443 OR 376/444 OR 376/371 OR 376/373)/CC
LS)
        578823 SHORT?
        673493 LENGTH
        282830 ROD#
          7391 SHORT?(P)LENGTH(P)ROD#
L2          21 376/439,443,444,371,373/CCLS AND (SHORT?(P)LENGTH(P)ROD#)

=> s l2 and (pressur? and critical(a)power or critical(a)heat)
        707928 PRESSUR?
        189164 CRITICAL
        453011 POWER
           146 CRITICAL(A)POWER
        189164 CRITICAL
        398176 HEAT
           171 CRITICAL(A)HEAT
L3            6 L2 AND (PRESSUR? AND CRITICAL(A)POWER OR CRITICAL(A)HEAT)

=> s l3 and (deflect? or vane#)
        137400 DEFLECT?
         30500 VANE#
L4            1 L3 AND (DEFLECT? OR VANE#)

=> d 14

12:57:28 COPY AND CLEAR PAGE, PLEASE
1.  5,091,146, Feb. 25, 1992, Steam vent tube for BWR fuel assembly; Gary
E. Dix, **376/443**, **371**, 377 [IMAGE AVAILABLE]

=> s l2 and (deflect? or vane#)
        137400 DEFLECT?
         30500 VANE#
L5            7 L2 AND (DEFLECT? OR VANE#)

=> d l5 1-7

1.  5,130,082, Jul. 14, 1992, Low pressure drop gas-liquid separator;
Willem J. Oosterkamp, **376/371**, 377 [IMAGE AVAILABLE]

2.  5,100,609, Mar. 31, 1992, Enhancing load-following and/or spectral
shift capability in single-sparger natural circulation boiling water
reactors; Willem J. Oosterkamp, 376/210, 209, **373**, 377; 976/DIG.48,
DIG.136 [IMAGE AVAILABLE]

3.  5,091,146, Feb. 25, 1992, Steam vent tube for BWR fuel assembly; Gary
E. Dix, **376/443**, **371**, 377 [IMAGE AVAILABLE]

4.  5,085,826, Feb. 4, 1992, Steam dryer; Willem J. Oosterkamp,
```

376/371; 55/399; 376/377 [IMAGE AVAILABLE]

5. 4,947,485, Aug. 7, 1990, Method for obtaining load-following capability in natural circulation, free-surface separation boiling water reactors; Willem J. Oosterkamp, 376/210, 241, **371**, 377, 379; 976/DIG.195, DIG.302 [IMAGE AVAILABLE]

6. 4,762,669, Aug. 9, 1988, Nuclear reactor core containing fuel assemblies positioned adjacent core baffle structure having annular 12:58:39 COPY AND CLEAR PAGE, PLEASE anti-vibration grids; Pratap K. Doshi, 376/442, **439**, **443**, 449; 976/DIG.78 [IMAGE AVAILABLE]

7. 3,979,257, Sep. 7, 1976, Boiling-water reactor; Diethelm Knodler, et al., 376/353, 225, **371**; 976/DIG.22, DIG.118 [IMAGE AVAILABLE]

=> d l3 1-6

1. 5,164,155, Nov. 17, 1992, Fuel bundle with **short** and intermediate part **length** **rods** minimized for flow induced vibration risk and **rod** bow; Richard A. Wolters, et al., 376/441, 370, 438, **439** [IMAGE AVAILABLE]

2. 5,091,146, Feb. 25, 1992, Steam vent tube for BWR fuel assembly; Gary E. Dix, **376/443**, **371**, 377 [IMAGE AVAILABLE]

3. 5,017,332, May 21, 1991, Two-phase **pressure** drop reduction BWR assembly design; Gary E. Dix, et al., 376/370, 377, 428, 435, **444** [IMAGE AVAILABLE]

4. 4,970,047, Nov. 13, 1990, Fuel assembly for nuclear reactors; Makoto Ueda, et al., **376/443**, **439**; 976/DIG.190 [IMAGE AVAILABLE]

5. 4,876,062, Oct. 24, 1989, Fuel assembly; Motoo Aoyama, et al., **376/444**, **443**, 447; 976/DIG.60 [IMAGE AVAILABLE]

6. 4,863,680, Sep. 5, 1989, Fuel assembly; Koichi Sakurada, et al., **376/444**, 438; 976/DIG.60, DIG.64 [IMAGE AVAILABLE]

=>

```
MS(1)
=> s (nuclear(a)reactor#)
         40009 NUCLEAR
         79984 REACTOR#
L7        8275 (NUCLEAR(A)REACTOR#)

=> s l7 and (part?(p)rod# or short?(p)rod#)
       1426717 PART?
        282830 ROD#
        103674 PART?(P)ROD#
        578823 SHORT?
        282830 ROD#
         27580 SHORT?(P)ROD#
L8        2387 L7 AND (PART?(P)ROD# OR SHORT?(P)ROD#)

=> s l8 and (spacer(p)pitch? or spacer(p)grid#(p)pitch?)
         67135 SPACER
         70069 PITCH?
           743 SPACER(P)PITCH?
         67135 SPACER
         41491 GRID#
         70069 PITCH?
            25 SPACER(P)GRID#(P)PITCH?
20 NOV 92 16:15:51          U.S. Patent & Trademark Office          P0023
L9          23 L8 AND (SPACER(P)PITCH? OR SPACER(P)GRID#(P)PITCH?)

=> s l9 and (upper(p)spacer# and lower(p)spacer#)
        660598 UPPER
         84588 SPACER#
         21419 UPPER(P)SPACER#
        928963 LOWER
         84588 SPACER#
         20968 LOWER(P)SPACER#
L10         16 L9 AND (UPPER(P)SPACER# AND LOWER(P)SPACER#)

=> s l9 and (pressur?)
'L1S' IS NOT VALID HERE

=> ds l9 and (pressur? and critical? or pressur?(p)dnb)
'DS' IS NOT A RECOGNIZED COMMAND

=> s l8 and (pressur?(p)critical? or pressur?(p)dnb or pressur?(p)film)
        707928 PRESSUR?
        195814 CRITICAL?
         28532 PRESSUR?(P)CRITICAL?
        707928 PRESSUR?
           142 DNB
            32 PRESSUR?(P)DNB
20 NOV 92 16:29:59          U.S. Patent & Trademark Office          P0024
        707928 PRESSUR?
        213373 FILM
         43882 PRESSUR?(P)FILM
L11        175 L8 AND (PRESSUR?(P)CRITICAL? OR PRESSUR?(P)DNB OR PRESSUR?(
P)F
               ILM)
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=> s l11 and (spacer#(p)pitch or spacer(p)grid(p)pitch?)
         84588 SPACER#
         70069 PITCH?
           975 SPACER#(P)PITCH?
         67135 SPACER
         38918 GRID
         70069 PITCH?
            21 SPACER(P)GRID(P)PITCH?
L12          2 L11 AND (SPACER#(P)PITCH? OR SPACER(P)GRID(P)PITCH?)

=> d l12 1-2

1.  3,966,550, Jun. 29, 1976, Reactor fuel assemblies; Ronald B. Foulds,
et al., 376/442, 445; 976/DIG.79 [IMAGE AVAILABLE]

2.  3,719,559, Mar. 6, 1973, FUEL PIN SPACER STRUCTURE; John C. Bass,
376/442; 976/DIG.65, DIG.73 [IMAGE AVAILABLE]

=> d l12 1-2
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=> s l8 and (critical(p)power(p)pressur? or dnb(p)pressur?)
        189164 CRITICAL
        453011 POWER
        707928 PRESSUR?
          1444 CRITICAL(P)POWER(P)PRESSUR?
           142 DNB
        707928 PRESSUR?
            32 DNB(P)PRESSUR?
L13   57 L8 AND (CRITICAL(P)POWER(P)PRESSUR? OR DNB(P)PRESSUR?)

=> s l13 and (spacer# or spacer(p)grid#)
         84588 SPACER#
         67135 SPACER
         41491 GRID#
          1023 SPACER(P)GRID#
L14   12 L13 AND (SPACER# OR SPACER(P)GRID#)
20 NOV 92 16:50:42   U.S. Patent & Trademark Office   P0027

=> s l14 and (spacer(p)pitch or vane# or deflect?)
         67135 SPACER
         63076 PITCH
           690 SPACER(P)PITCH
         30500 VANE#
        137400 DEFLECT?
L15   6 L14 AND (SPACER(P)PITCH OR VANE# OR DEFLECT?)

=> d l15 1-6

1. 5,139,736, Aug. 18, 1992, Fuel assembly support grid; William J. Bryan, 376/442, 438, 439, 462 [IMAGE AVAILABLE]

2. 5,020,411, Jun. 4, 1991, Mobile assault logistic kinetmatic engagement device; Larry Rowan, 89/1.11; 60/203.1; 89/8; 376/319 [IMAGE AVAILABLE]

3. 4,879,090, Nov. 7, 1989, Split **vaned** nuclear fuel assembly grid; Patrick A. Perrotti, et al., 376/462, 439, 442; 976/DIG.60, DIG.78 [IMAGE AVAILABLE]

4. 4,844,861, Jul. 4, 1989, Fuel assembly for **nuclear** **reactors**; Joseph Leclercq, 376/439, 438, 440, 442, 462; 976/DIG.59 [IMAGE AVAILABLE]

5. 4,844,860, Jul. 4, 1989, Support grid with integral **vanes**; Stephen C. Hatfield, 376/439; 976/DIG.60, DIG.76, DIG.78 [IMAGE AVAILABLE]
20 NOV 92 16:52:18   U.S. Patent & Trademark Office   P0028

6. 3,844,888, Oct. 29, 1974, HELICAL FLOW **DEFLECTOR** CONE FOR FUEL ELEMENT ASSEMBLIES; John N. Calvin, 376/439; 239/463, 501; 976/DIG.60 [IMAGE AVAILABLE]

=> d l14 1-12

1. 5,143,691, Sep. 1, 1992, Fuel assembly with flow tripper for a

boiling water reactor; Hans-[redacted]chim Lippert, et al., 376/443, [redacted], 439, 444 [IMAGE AVAILABLE]

2. 5,139,736, Aug. 18, 1992, Fuel assembly support grid; William J. Bryan, 376/442, 438, 439, 462 [IMAGE AVAILABLE]

3. 5,020,411, Jun. 4, 1991, Mobile assault logistic kinetmatic engagement device; Larry Rowan, 89/1.11; 60/203.1; 89/8; 376/319 [IMAGE AVAILABLE]

4. 4,879,090, Nov. 7, 1989, Split vaned nuclear fuel assembly grid; Patrick A. Perrotti, et al., 376/462, 439, 442; 976/DIG.60, DIG.78 [IMAGE AVAILABLE]

5. 4,863,680, Sep. 5, 1989, Fuel assembly; Koichi Sakurada, et al., 376/444, 438; 976/DIG.60, DIG.64 [IMAGE AVAILABLE]

6. 4,844,861, Jul. 4, 1989, Fuel assembly for **nuclear** **reactors**; Joseph Leclercq, 376/439, 438, 440, 442, 462; 976/DIG.59 [IMAGE AVAILABLE]

7. 4,844,860, Jul. 4, 1989, Support grid with integral vanes; Stephen C. Hatfield, 376/439; 976/DIG.60, DIG.76, DIG.78 [IMAGE AVAILABLE]

8. 4,832,906, May 23, 1989, Fuel assembly; Motoo Aoyama, et al., 376/419, 435, 455, 903, 917; 976/DIG.64 [IMAGE AVAILABLE]

9. 4,708,845, Nov. 24, 1987, BWR fuel assembly with improved **spacer** and fuel bundle design for enhanced thermal-hydraulic performance; Claude M. Mildrum, et al., 376/435, 349, 414, 419, 434, 438, 442, 443; 976/DIG.64, DIG.78 [IMAGE AVAILABLE]

10. 4,204,909, May 27, 1980, Temperature sensitive self-actuated scram mechanism; Nicholas Giuggio, et al., 376/247, 327, 336; 976/DIG.147 [IMAGE AVAILABLE]

11. 4,113,563, Sep. 12, 1978, Fuel arrangement for high temperature gas cooled reactor; Joseph M. Tobin, 376/427, 352, 396; 976/DIG.7, DIG.25 [IMAGE AVAILABLE]

12. 3,844,888, Oct. 29, 1974, HELICAL FLOW DEFLECTOR CONE FOR FUEL ELEMENT ASSEMBLIES; John N. Calvin, 376/439; 239/463, 501; 976/DIG.60 [IMAGE AVAILABLE]

=>

```
 s (nuclear(a)reactor#)
         40009 NUCLEAR
         79984 REACTOR#
L1        8275 (NUCLEAR(A)REACTOR#)

=> s l1 and (two(a)phase# or boiling(a)water(a)reactor# or bwr)
       1253664 TWO
        319960 PHASE#
         28472 TWO(A)PHASE#
        109903 BOILING
        510855 WATER
         79984 REACTOR#
           924 BOILING(A)WATER(A)REACTOR#
           455 BWR
L2         1002 L1 AND (TWO(A)PHASE# OR BOILING(A)WATER(A)REACTOR# OR BWR)

=> s l2 and (part(p)length(p)rod# or partial(p)length(p)rod# or short?(p)rod#)
        922305 PART
        673493 LENGTH
        282830 ROD#
          7218 PART(P)LENGTH(P)ROD#
        274248 PARTIAL
        673493 LENGTH
        282830 ROD#
18:17:44 COPY AND CLEAR PAGE, PLEASE
           572 PARTIAL(P)LENGTH(P)ROD#
        578823 SHORT?
        282830 ROD#
         27580 SHORT?(P)ROD#
L3         170 L2 AND (PART(P)LENGTH(P)ROD# OR PARTIAL(P)LENGTH(P)ROD# OR
SHO
               RT?(P)ROD#)

=> s l3 and (pressur?)
        707928 PRESSUR?
L4         148 L3 AND (PRESSUR?)

=> s l4 and (spacer# or spacer(a)grid#)
         84588 SPACER#
         67135 SPACER
         41491 GRID#
           306 SPACER(A)GRID#
L5          59 L4 AND (SPACER# OR SPACER(A)GRID#)

=> s l5 and (first(p)spacer# and second(p)spacer#)
       1164444 FIRST
         84588 SPACER#
         19057 FIRST(P)SPACER#
       1057979 SECOND
         84588 SPACER#
18:34:29 COPY AND CLEAR PAGE, PLEASE
         17901 SECOND(P)SPACER#
L6          10 L5 AND (FIRST(P)SPACER# AND SECOND(P)SPACER#)

=> d l6 1-10
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